Diffusion-weighted MRI in detection of renal metastases

Ankur Goyal, Raju Sharma, Ashu Bhalla, Shivanand Gamanagatti

Department of Radiodiagnosis, All India Institute of Medical Sciences (A.I.I.M.S.), New Delhi, India

Correspondence to
Professor Raju Sharma, raju152@yahoo.com

DESCRIPTION

A 25-year-old man, diagnosed with primitive neuroectodermal tumour of the left tibia, presented with abdominal pain. His serum creatinine was 2.5 mg/dL. Sonography revealed multiple abdominal masses which warranted contrast-enhanced CT (CECT)/MRI for accurate disease assessment. However, considering the risk of contrast-induced nephropathy (with iodinated contrast in CECT) and nephrogenic systemic fibrosis (with gadolinium chelates in CE MRI), contrast was not administered. The patient underwent non-contrast MRI along with diffusion-weighted (DW) imaging on a 1.5 T scanner. Axial DW sequence was performed at b-values of 0, 500 and 1000 s/mm^2 and apparent diffusion coefficient (ADC) maps for quantification of diffusion restriction were generated.

Axial DW images at b 500 s/mm^2 (figure 1A), b 1000 s/mm^2 (figure 1B) and ADC map (figure 1C) clearly demonstrated bilateral multiple renal metastases showing marked restriction of diffusion of water molecules, attributable to high cellularity of primary tumour. Relative to conventional MRI sequences (figure 1D), the lesion-to-background contrast was significantly better in DW images, making these focal lesions much more conspicuous on DW MRI.

DW MRI has been a part of our imaging protocol for renal lesions since 2008. It is an excellent means to demonstrate multiple renal metastases, which may not be so conspicuous on conventional CT/MRI. Moreover, additional lesions may be detected, and this may preclude surgical resection for apparently solitary lesions. The elegant display of multiple lesions against a suppressed background signal may substitute and even supersede CE imaging.[1]

DW MRI characterises tissues by detecting alterations in thermally induced Brownian motion of water molecules within them. The addition of DW imaging to routine abdominopelvic MRI protocols yields diagnostically helpful information with little increase in imaging time.[2] Moreover, DW MRI may obviate the need for contrast administration, which is desirable since patients with focal renal lesions may have associated renal dysfunction.[3]

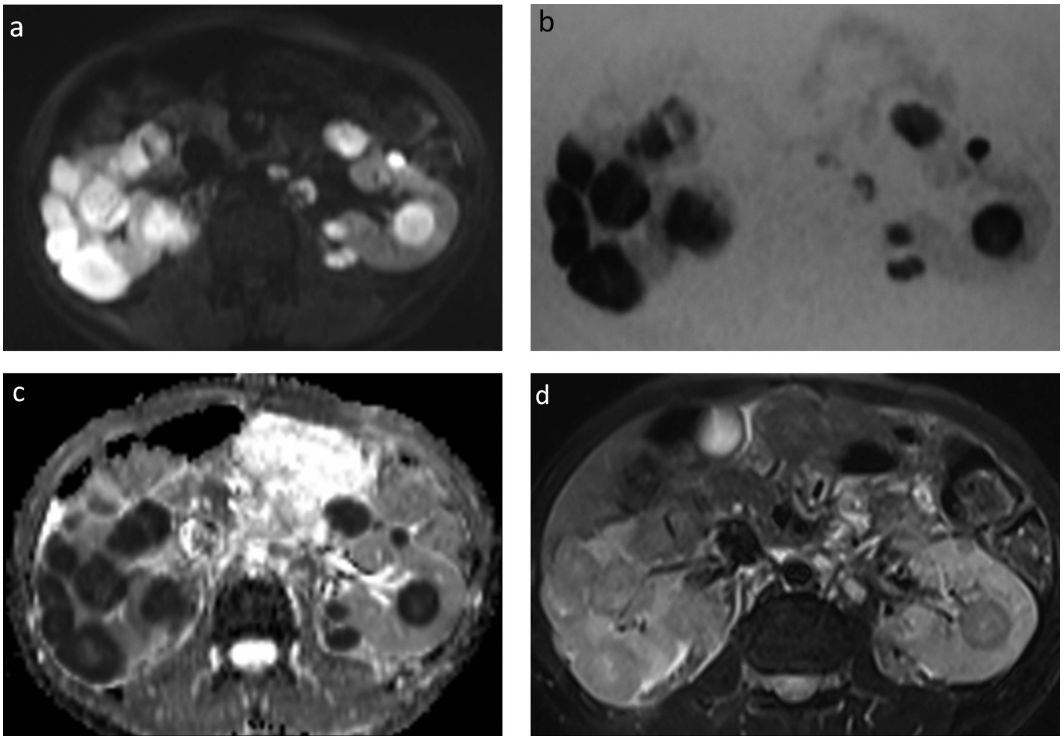

Figure 1 (A) Diffusion-weighted (DW) image at b 500 s/mm^2 showing bilateral multiple renal lesions with hyperintense signal, suggesting restricted diffusion of water molecules. Also noted are a few subcentimetric retroperitoneal lymph nodes, showing restricted diffusion. (B) Contrast-inverted DW image at b 1000 s/mm^2 depicts the metastatic lesions showing restricted diffusion as having a dark signal. (C) Apparent diffusion coefficient (ADC) map for quantification of diffusion restriction demonstrated mean ADC value of 0.8335 ($\times 10^{-3}$ mm^2/s) within the metastases and 2.2658 ($\times 10^{-3}$ mm^2/s) in the normal renal parenchyma. (D) Corresponding T2-weighted image showing renal metastases as ill-defined lesions of abnormal signal intensity. Note the markedly better lesion-to-background parenchyma contrast on DW MRI.

To cite: Goyal A, Sharma R, Bhalla A, *et al*. *BMJ Case Rep* Published online: [*please include* Day Month Year] doi:10.1136/bcr-2013-201555

Learning points

- Diffusion-weighted (DW) MRI provides excellent depiction of multiple renal metastases, which may not be conspicuous on conventional CT/MRI.
- Lesion-to-background contrast is better, and additional lesions may be detected which may preclude surgical resection for apparently solitary lesions.
- DW MRI provides a contrast-free alternative, which is desirable in patients with renal dysfunction.

Contributors All authors made significant contributions to the drafting, editing and final approval of the manuscript.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

1 Kilickesmez O, Inci E, Atilla S, *et al*. Diffusion-weighted imaging of the renal and adrenal lesions. *J Comput Assist Tomogr* 2009;33:828.
2 Saremi F, Knoll AN, Bendavid OJ, *et al*. Characterization of genitourinary lesions with diffusion-weighted imaging. *Radiographics* 2009;29:1295.
3 Goyal A, Sharma R, Bhalla AS, *et al*. Diffusion-weighted MRI in inflammatory renal lesions: all that glitters is not RCC! *Eur Radiol* 2013;23:272–9.